





BUILDING FOR THE FUTURE

Liverpool City Region is an international success story in offshore wind energy, leading the way in new technologies, investment opportunities, infrastructure creation and supply chain development support.

56% of Europe's investment in offshore wind energy came to the UK in the past five years: £4.3 billion of that came to Liverpool City Region.

A UK government-designated Centre for Offshore Renewable Engineering (CORE), Liverpool Bay has one of the largest concentrations of offshore wind assets in the world, with over 270 turbines in operation. It also boasts the first operational deployment of the world's largest wind turbines, the 8MW Mitsubishi Vestas V164. 32 V164 turbines came into operation in 2017 at Ørsted's Burbo Bank Extension windfarm.

This is just the beginning: With ever-increasing investment in offshore wind energy supported by local R&D capability, a strong, existing supply chain, world class infrastructure, connectivity and a long-term vision for growth, Liverpool City Region will continue to lead the way in offshore wind energy.



LEADING THE WAY

Liverpool Bay is the cradle of the emerging European offshore wind industry. It's the location of the UK's first commercial offshore windfarm, built in 2007, with the first commercial deployment of the Siemens 3.6 MW turbines. We now house the first deployment of the Mitsubishi Vestas 8MW turbines.

With this pedigree comes an unrivalled breadth of expertise in all aspects of the offshore wind supply chain, from establishment services, such as financial, legal, environmental and site preparation, through manufacturing, fabrication and construction to logistics, operations and maintenance.

Liverpool Bay has attracted investors from across Europe. From major energy companies, such as Ørsted, RWE, SWM and Iberdrola, through to commercial investors, such as PKA and Lego Group: these companies have invested £4.3 billion in the last five years.

Within 60km of Liverpool lie the UK headquarters of leading offshore wind supply chain companies, including ABB, Siemens and Vestas.

To us, offshore wind energy is a reality. It's about much more than building wind farms; we have helped create, shape and realise key milestones in the offshore wind industry, by harnessing our academic, research and business talent and expertise. We intend to continue to lead the world and ensure that offshore wind fulfils its global potential.

We want to share our expertise and experience with the world and we want to help the offshore wind energy industry make the most of opportunities here in our city region, across the UK and around the globe.

POWERFUL PARTNERSHIPS

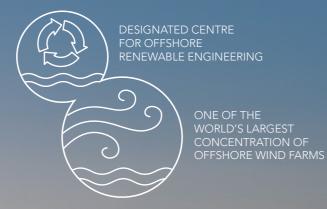
RWE created a construction base at the Cammell Laird facility in Birkenhead, for the installation of the Gwynt y Môr offshore windfarm. The project saw the deployment of 164 Siemens turbines in Liverpool Bay.

Liverpool Bay is one of Ørsted's principal European operations sites, with two windfarms constructed in 2007 and 2017. Ørsted and MHI Vestas created a construction base at Cammell Laird to support the development of the Burbo Bank Extension windfarm in 2016.

Ørsted's new state-of-the-art operations and maintenance base on the River Mersey opened in 2017 to service their southern Irish Sea windfarms.

Any one of these factors would create a sector leader but the industry knowledge, expertise and facilities of these businesses, combined with the wider supply chain, local talent pool and location of Liverpool City Region, as well as R&D and public sector support, have created a global hub for offshore wind energy.

Backed by UK government, we are working with private business to create a powerful partnership of capability and capacity to service the rapidly expanding UK, European and global offshore wind energy industries.



CASE STUDY ØRSTED

Operating out of Liverpool Bay for a decade, global offshore wind energy giant Ørsted, is a leading energy supplier to the industrial and commercial market. The UK is the Danish company's primary market for offshore wind and Ørsted's Burbo Bank windfarm in Liverpool Bay was inaugurated in 2007, the first to employ the 3.6MW wind turbines now used widely across the industry. Construction of the Burbo Bank Extension, managed from Ørsted's facilities at Cammell Laird, on the banks of the Mersey, was inaugurated in May 2017.

Its development and construction was founded on strong relationships with UK businesses, which played key roles in the supply chain and in the delivery of the project.

The world's first deployment of a new 8MW turbine, producing more than double the power of the existing Burbo Bank turbines, highlights Liverpool City Region's role in pioneering the future of the offshore wind energy industry.

Ørsted continues to lead supply chain events, developed in partnership with Liverpool City Region and now rolled out, worldwide, as its exemplar model, to strengthen local partnerships. It has also built a £multi-million operations and maintenance facility on the banks of the Mersey in Wirral, to serve the existing Burbo Bank offshore windfarm and the new Burbo Bank Extension.

Around 45 people are based at the site, providing offshore access and flexibility.

A report ¹ published in June 2016 estimated that Ørsted will have invested £5.4 billion in developing offshore windfarms off the North West of England by 2019, which opens up potential opportunities to Liverpool City Region-based partners.

Lee Rollason, Head of Burbo Bank Operations, said "I think working closely with Wirral Council (part of the Invest Liverpool team) has proven very beneficial to us, particularly being involved with its 'Clean Energy Coast' initiative, that's

something we're proud to be a part of.
"Wirral Council is very forthcoming as a partner. It helped us

"There were a couple of other locations we were looking into and working with the team enabled us to find the best solution for Ørsted and the local residents. We have a great relationship with them."

Regeneris Consulting, 2016 - The Economic Impact of DONG Energy

pick out the Kings Wharf spot.



EVERYTHING YOU WANT, IN **ONE PLACE**

In Liverpool City Region, we don't see offshore wind as 'alternative' energy or a niche solution. To us, it is the future: vital to keeping the lights on around the world and meeting the growing demand for power.

That's why we are committed to strengthening our position as a world leader and combining everything from land and facilities to fabrication and construction, supply chain to installation, operations to maintenance and R&D to global shipping and logistics, all within our city region.

The huge amount of activity associated with our existing offshore generation, coupled with future offshore development expected for the Irish Sea Zone, mean there is no shortage of opportunities for businesses entering the UK market.

More than 18 million people are within the drivetime of Liverpool. This gives companies locating in the area easy access to a large talent pool of both people and companies. Our leading R&D, digital and engineering facilities and expertise provide the perfect platform for the development and deployment of offshore innovation. Whether you are developing sensor technologies, IoT applications, new materials or pioneering engineering solutions, we have the assets and know-how to accelerate your innovation and growth.

As the busiest port on the UK's west coast and the main hub for North American container and intermodal trade, we are well placed to support the growing US market. Our unique outsized RoRo cargo services linking North America and Europe through the Liverpool hub enable main offshore wind components to be moved quickly and cost effectively. We are a key location for shipping line headquarters, freight forwarding and professional services firms – an ideal base for businesses that want to take advantage of the growing global need for offshore wind energy.

We actively support those businesses, with financial mechanisms and incentives, including growth funds, Enterprise Zones and reduced corporation tax for R&D.

If you want it, we have it and that's what sets us apart as a global hub for investment into offshore wind energy.

HOME TO WORLD CLASS RESEARCH CENTRE OF EXCELLENCE AND FACILITIES

£400 MILLION LIVERPOOL2 DEEP WATER TERMINAL TAKES 95% OF WORLD'S LARGEST SHIPS





CASE STUDY CAMMELL LAIRD

Cammell Laird has been at the heart of British manufacturing for the last two centuries and major investment in its port infrastructure and facilities are seeing it play a critical role in the region's offshore wind industry.

From its Birkenhead site, on the River Mersey, it handles huge component parts for the construction of the windfarms in the Irish Sea, working with international partners such as RWE and Ørsted.

One of the best and most competitive heavy fabrication facilities in the engineering industry, Cammell Laird has one of the largest modular construction halls in Europe and with world-class facilities and the right engineering skills it provides services to offshore wind energy, maritime, civil nuclear, oil and gas and petrochemicals projects.

Ship-building and refitting capabilities continue to be at the heart of Cammell Laird's work, winning contracts to construct the flight decks for the Royal Navy's new aircraft carrier and beating international competition to build a £200 million polar research ship, which will be equipped with on-board laboratory facilities and robotic technologies.

CASE STUDY CLARKE ENERGY (A KOHLER COMPANY)

Liverpool City Region success story Clarke Energy was founded in 1989 and today employs more than 1,000 people in 17 countries from Algeria to New Zealand.

It supplies, installs and maintains high efficiency embedded power plants, with over 5,000MW of reference plants globally which can generate enough electricity to supply the equivalent of 13 million UK homes.

Leading on low carbon and renewable power, with Liverpool City Region plants including Broadgreen Hospital and the University of Liverpool and a range of international projects, Clarke Energy is a key player in the low carbon economy.

A regular winner of industry awards for its international success Clarke Energy is a holder of the Queen's Award for enterprise and in 2016, it was named Exporter of the Year Award at the North West Business Masters Awards, for a second year running.

8 OFFSHORE WIND 9

INVESTING IN **EXPERTISE**

Liverpool City Region is open for business, across the Offshore Wind Energy industry. We have the experience, infrastructure, R&D and support mechanisms in place to deliver a good return on your investment.

With major developers and Tier 1's already based here for the installation and technical support of Irish Sea offshore wind farms and international institutions, such as Lego Group and the city of Munich's utility provider SWM, investing in next generation Liverpool Bay facilities, we have the confidence and the scale to deliver real returns.

Businesses such as ABB, Siemens, Ørsted, Maersk, Jaguar Land Rover, Airbus and Unilever – all based in the region – demonstrate our expertise in marine sectors, engineering, manufacturing and R&D.

The right businesses are here and we have the connections, trade links, talent pool and a track record of success. Most of all, we have a clear vision, a long-term strategy and opportunities for inward investment partners and forward-thinking businesses involved, directly or indirectly, in offshore wind energy.

10 OFFSHORE WIND

As a Centre for Offshore Renewable Energy (CORE), Liverpool City Region is at the heart of relationships between offshore wind energy business, supply chain and UK government, providing support, removing barriers and laying the foundations for ongoing success and return on investment.



LIVERPOOL CATCHMENT – 11 UNIVERSITIES, OVER 210,000 STUDENTS

HIGHLY-SKILLED TALENT

We have a highly-skilled workforce, with 50,000 people employed in the manufacturing sector; a third of these are currently employed directly within offshore engineering and related industries.

These skills are supported by further and higher education institutions, including Liverpool John Moores University's Maritime Engineering Campus, Port Academy Liverpool and The Engineering College.

University of Liverpool is a world-class university ranked in the top 1% globally. The University carries out world leading and internationally significant research in a variety of disciplines supporting offshore wind including renewable energy, chemistry, advanced materials, autonomous systems, electronics, computer sciences and oceanography.

Liverpool John Moores University's department of Maritime and Mechanical Engineering is one of the UK's leading centres for maritime and engineering education and research. The departments research areas focus on maritime, logistics and offshore engineering and advanced manufacturing electrical power.

Liverpool Hope University has recently invested £14.47 million in a facility to include STEM, is introducing new degrees in Robotics and is in the top 20 of all UK universities for the percentage of academic staff with doctorates.

The Energy Centre at the **University of Chester** promotes growth and acceleration in the development, demonstration and exploitation of technologies for the energy market.

Edge Hill University has been named The Times Higher Education University of the Year and within an hour of the city region, there is great engineering talent at universities in Manchester, Salford, Lancaster and Preston.

Across the region, dozens of providers are working with employers to deliver engineering and logistics skills training and apprenticeships, which will support the offshore wind energy industry.

With existing expertise, proven facilities, a long-term growth strategy and a vision for developing future skills and innovation, Liverpool City Region offers a lower cost and lower risk solution for the offshore wind energy industry.



THE FOUNDATIONS **ARE LAID**

With a manufacturing industry of 6,000 companies, employing 50,000 people, across the region, there is already a broad talent pool of skilled people and a proven integrated supply chain.

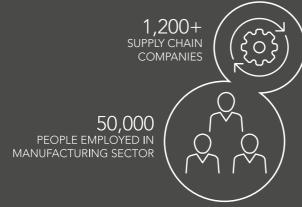
As well as our existing offshore capabilities, there is an internationally recognised aerospace industry within a one hour drive of Liverpool City Region.

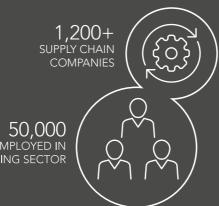
This aerospace sector is the largest in Europe, with over 250 companies contributing £7 billion to the UK economy. The industry employs a highly-skilled workforce with specific expertise in airframe design and manufacture, final assembly and aircraft engine subsystems.

The region's strong automotive sector adds to this, employing thousands of people with skills in fabrication, manufacturing and assembly. This is a key asset in the region and it creates a talent pool of people with skills that are transferable to the offshore energy industry.

The presence of major global players, such as Rolls Royce, Airbus, BAE, Jaguar Land Rover, INEOS and PSA has driven the supply chain, with leading local companies working closely with industry partners on state-of-the-art projects such as the latest composite structures and titanium components.

In addition to more than 250 companies specialising in providing a huge range of products and services to the offshore engineering sector, this wider supply chain offers an enormous advantage when it comes to reducing logistics costs and is a major driver in the successful delivery of offshore renewable energy projects and ensuring a strong return on investment.









CASE STUDY BIBBY HYDROMAP

Bibby HydroMap provides a range of seabed survey services to global businesses, from its Liverpool City Region base.

Hydrography, engineering geophysics, marine geotechnics and oceanography services are delivered by a team of more than 100 specialists and boosted by five purpose-built vessels, with advanced survey and positioning equipment.

The latest addition to the fleet is the custom-built d'ROP (dynamic Remotely Operated Platform), which will revolutionise productivity in shallow water remote survey and inspection.

Working with leaders in offshore renewables, oil and gas, subsea cables, marine aggregates and port/harbour operation, Bibby HydroMap is world-renowned.

In 2013 it was awarded a Regional Growth Fund (RGF) by Wirral Council which allowed it to deliver a growth strategy that included investing in new-build vessels and state-of-theart equipment.

CASE STUDY **HUGHES SUB SURFACE ENGINEERING** (A JAMES FISHER & SON COMPANY)

Specialises in subsea engineering, civil engineering and offshore construction, both above and below the waterline, Hughes Sub Surface Engineering was founded in Liverpool City Region in 2005.

Its expertise in offshore renewables has seen it play a key role in supporting the construction and maintenance of offshore windfarms such as Gwynt y Mor, Walney, Teesside and London Array.

In 2016, the company was appointed by Ørsted to conduct subsea inspections on several of the Danish company's offshore wind farms in Denmark and Germany.

Operating in the most challenging environments, its services include commercial diving, UAV, working at heights, confined space entry and remote intervention, including remotely operated vehicle technologies.

Hughes Sub Surface Engineering also has experience in the Oil & Gas Market, recently opening an office in Aberdeen.

THE RIGHT PLACE FOR YOU TO BE

Liverpool City Region is ideally situated, in the middle of the UK. We are also one of very few locations capable of connecting East and West Coast operations, through a fully-integrated ports, land holdings, marine fabrication and supply chain solution.

With a range of UK-wide facilities, stretching across the country, provided by partners Peel Ports, Peel Holdings, Cammell Laird and A&P, Liverpool City Region's offshore wind energy businesses benefits from a flexible two-way logistics flow, across the country, making it the ideal industry hub.

When linked with the Port of Liverpool's RoRo, container and cargo facilities, this solution becomes a gateway to global trade.

Our national and international connectivity has attracted some of the world's top shipping lines to base operations here: Maersk, NYK, CMA-CGM, ACL, Zim, Stena Line, MSC and Hapag Lloyd.

The Port of Liverpool has undergone a massive expansion, with the £400 million Liverpool2 deep water terminal, creating one of Europe's most advanced container terminals and capable of accommodating the world's largest vessels. The port is also investing in three inland ports along the Manchester ship canal.

Logistics company Stobart and retailer Tesco are capitalising on opportunities created by a Liverpool City Region location and have developed 3MG, a major multimodal transport hub. Other major logistics operators in the region include Geopost, GEFCO and DHL.

With the very best road, rail, air and water connectivity, Liverpool City Region and the wider North West's connectivity provides our offshore wind energy industry with UK-wide, European, Baltic and Global reach – vital to making the most of emerging markets around the world, including the USA, South America and Japan.

THE FUTURE IS **NOW**

Our vision is to continue to grow as a global centre of excellence for the offshore wind industry. Partnerships between the public and private sectors are linking the industry, its wider supply chain and R&D expertise to create more opportunities for growth.

Our institutions and research centres are at the forefront of innovations such as composites and computational modelling. We are home to some of the world's best hydromapping businesses and pioneers such as Bibby Hyrdromap, which is using gunsight technology to enable safer access to turbines on site to cut the number of vessels needed to service windfarms and reduce maintenance costs.

Liverpool John Moores University's Department of Maritime and Mechanical Engineering is a world leader, collaborating with leading institutions, such as the World Maritime University, Lille University of Technology, Hong Kong Polytechnic University, Incheon University, Wuhan University of Technology and Manchester University. It has a facility with navigation and radar simulation training equipment and an advanced shiphandling simulator: the only one of its kind in the UK, with a 360° field-of-view visual system.

The University of Liverpool's Stephenson Institute for Renewable Energy has particular expertise in the aerodynamic modelling of turbines. While its Centre for Intelligent Monitoring Systems has expertise in the diagnosis, measurement and monitoring of complex systems in hazardous environments, utilising non-intrusive techniques.

From this research, it has developed relationships with internationally renowned partners working in offshore wind energy and associated technologies, such as Ocean University China, CENER (Spanish Centre for Renewable Energy research), HR Wallingford, EDF, Scottish Power and Siemens.

The National Oceanography Centre is a world class oceanographic research facility. With the largest collection of marine modellers in the UK, it contributes expertise on the shelf scale, ocean margin, coastal/estuarine modelling of hydrodynamics, ecosystems, sediment transport and surface waves, as well as global ocean circulation models.

It also provides advice and data on conditions for offshore operations and has capability in numerical modelling of tides and waves for resource estimation, as well as the assessment of impact of device deployment on the physical environment and ecosystems.



LCR 4.0

Liverpool City Region is a UK exemplar region, leading the way on changing how industry thinks about the processes and possibilities of manufacturing and production.

Sensors, big data and robotics are transforming the way industry 'makes' and the Industrial Internet of Things and Industry 4.0 heralds the biggest change to manufacturing since the steam engine.

With our LCR 4.0 Programme, we are at the vanguard of this agenda, creating a new infrastructure that connects physical and digital assets. By encouraging the convergence of our manufacturing and digital sectors, we are becoming a hardware test bed for sensory technology and data communications systems.

This includes **Sensor City** – a University Enterprise Zone and one of the world's first incubators dedicated to the development and exploitation of sensor technology.

There are also the world-class Campus Technology Hub, which can rapidly develop prototypes and the **Engineering** and Technology Research Institute, with internationally renowned facilities that include the **Advanced** Manufacturing Technology Research Laboratory.

The Hartree Centre is a collaborative research and innovation centre, focused on accelerating the adoption of data-centric computing, big data and cognitive technologies by industry to create a competitive advantage. It has an almost infinite capacity to undertake modelling and computational data,

The University of Liverpool's Virtual Engineering Centre, also at Sci-Tech Daresbury, is the UK's leading centre of Virtual Engineering technology integration for industrial and commercial applications.

Its virtual design and manufacture capabilities use the latest 3D visualisation and Physics-based simulations, allowing businesses to explore designs and optimise manufacturing and maintenance processes, which will reduce development times and improve operational maintenance.

Offshore Wind Energy businesses that invest in Liverpool City Region will have the opportunity to collaborate and partner with this world-class infrastructure, which is driving change and creating a true commercial edge. Working together, our academic researchers and offshore wind energy businesses are looking beyond next generation technologies and focusing on new solutions - bigger turbines, floating windfarms and clusters further out at sea, in deeper water – as a world leading industry hub, Liverpool City Region is creating the future, today.



NEXT GENERATION

Sci-Tech Daresbury is a national science and innovation campus, ranked as the UK's leading science park for innovation.

It is home to STFC Daresbury Laboratory and The Cockcroft Institute, conducting leading-edge research and development and boasts a huge array of engineering and digital facilities that Liverpool City Regions offshore wind energy industry can access.

As well as providing access to these cutting-edge facilities, Sci-Tech Daresbury houses around 100 technology companies including IBM and Lockheed Martin, all pioneering open innovation working, of which our region's industry can take full advantage.

Liverpool City Region's long-term strategy and vision creates the environment for our offshore energy industry to collaborate with a world class research community, which drives sustained commercial success.



THE BEST PLACE FOR YOUR PEOPLE

Liverpool City Region is a wonderful and diverse place, which offers a lifestyle and quality of life to suit everyone: it is one of the best recruitment and retention tools you could possibly have.

With the historic and cosmopolitan City of Liverpool at its core and everything from breath-taking coastlines to unspoilt woodland and grand Georgian terraces to leafy country lanes, our region is an excellent place to live and work. We also have an abundance of excellent hotels and serviced apartments, for visitors and contractors to stay.

Our region boasts some of the world's top universities and Liverpool ranks consistently highly in lists of the UK's friendliest cities.

A vibrant nightlife of music venues, clubs and restaurants always offers something new, with cuisines from across the globe, world-class fine dining and a rich musical culture that continues to break new ground.

In Liverpool City Region, we have the largest collection of museums and galleries of any UK region outside of London and we are home to a range of internationally renowned theatres, which contribute to our world-class cultural offering. In Liverpool, there is the £1 billion Liverpool ONE retail and leisure development, with shops, cafés, restaurants and bars spanning 42 acres. There is also a range of other leisure and retail developments across the city and as you explore our region, you will find everything from bustling markets to vibrant village centres.

Spectacular National Trust coastline, nature reserves and wildlife, a UNESCO World Heritage Site, Open-hosting golf courses, the world's greatest steeplechase (the Grand National), two Premier League football clubs and Super League rugby clubs are just some of our leisure and sports offerings.

If you want to attract the best people, you need to offer them the best place to live and work and Liverpool City Region truly delivers.

WORKING FOR YOU

For developers, manufacturers and suppliers who invest in Liverpool City Region, we can give you all this and access to a growing West Coast UK market. We can also give you a gateway to the rest of the UK and the world.

We have the skills, infrastructure, connectivity, supply chain, support mechanisms and R&D to ensure a long-term return on this investment.

We have the partners, the vision and the facilities to help you drive the offshore wind energy industry – and your commercial success - into the future.

We have a team of business location experts that is ready to help you. We can provide research on markets, sectors and workforce demographics.

We can help you make the right connections and we can support your investment and growth.

With a long-term strategy driving the future and billions in investment secured, in projects such as Gwynt y Môr - one of the largest offshore wind farms under construction in Europe - and opportunities in new rounds of offshore windfarms, Liverpool City Region is the place to invest.

You could benefit from the next generation technology being pioneered in Liverpool Bay, the innovative monitoring and maintenance solutions that are changing the industry or the fully-integrated supply chain that drives the industry globally. This is an exciting time to invest in Liverpool City Region.

In Liverpool City Region, we support growth and investment, with specialist teams and our networks of business and research institutions that work together to ensure prosperity and strong returns.

We offer a range of incentives and support, including funding packages. Liverpool is within an assisted area and has several Enterprise Zones, which offer additional incentives.

To find out more about this support, visit www.investliverpool.com

Liverpool City Region is the place for offshore wind energy.





We have a team of business location experts from across Liverpool City Region that can assist you with your next project.

We can provide detailed research on markets, sectors and workforce demographics. We can put you in touch with the right contacts at industry networks and partner organisations. We're happy to introduce you to potential partners at our world-class universities and our existing businesses. We can help you to identify all the available support to help your expansion and show you a wider range of sites, premises and development opportunities.

For further information and support email: investliverpool@liverpool.gov.uk.

We look forward to working on your plans with you.

investliverpool.com





















